

Better Use of the Landsat Temporal Domain: Monitoring Land Cover Type, Condition and Change

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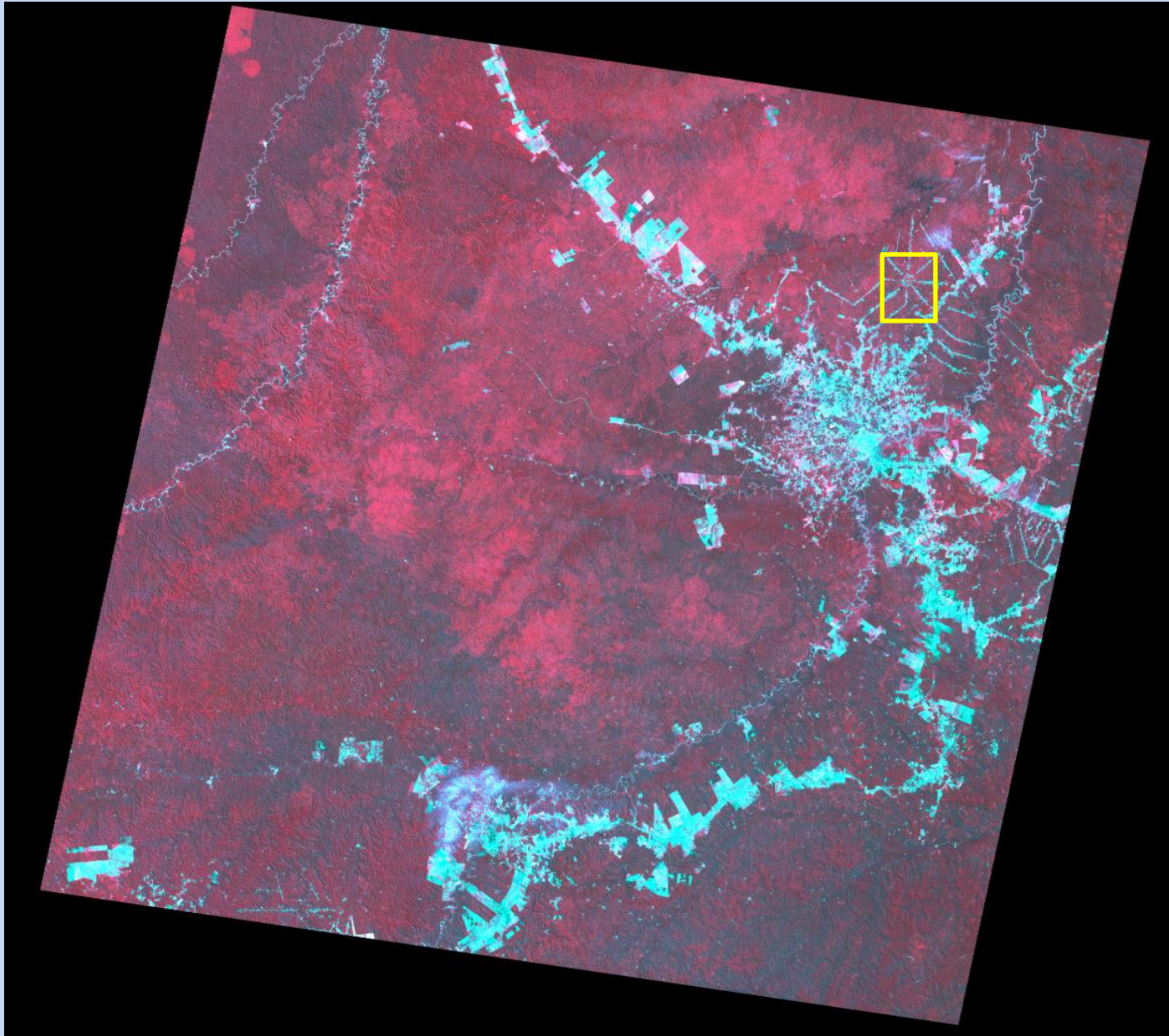
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Boston University

Use All Available Data

- Multitemporal Cloud Screening
- Phenology
 - Land surface characterization
 - Interannual variability in phenology
- Land cover change
- Land surface condition and trends
- Integration with Sentinel 2 (and maybe 1)

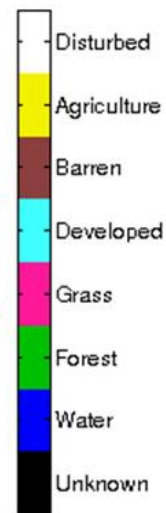
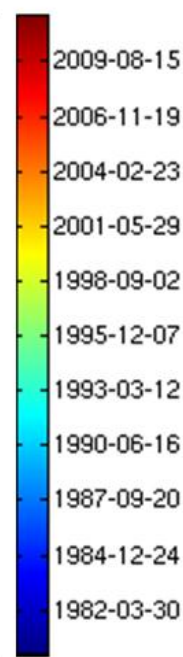
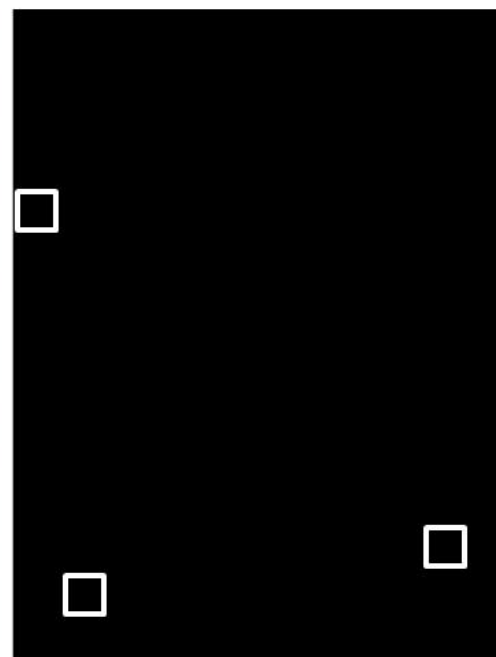
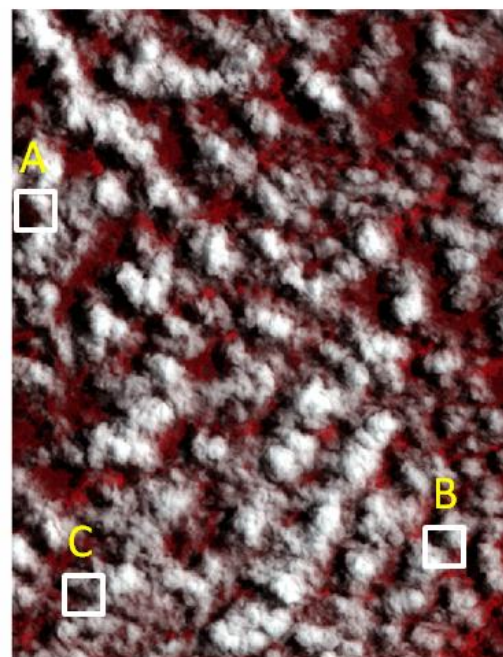
Amazon, Aug. 6th 1986, Path/Row =2/67, Band 4, 3, and 2 composite



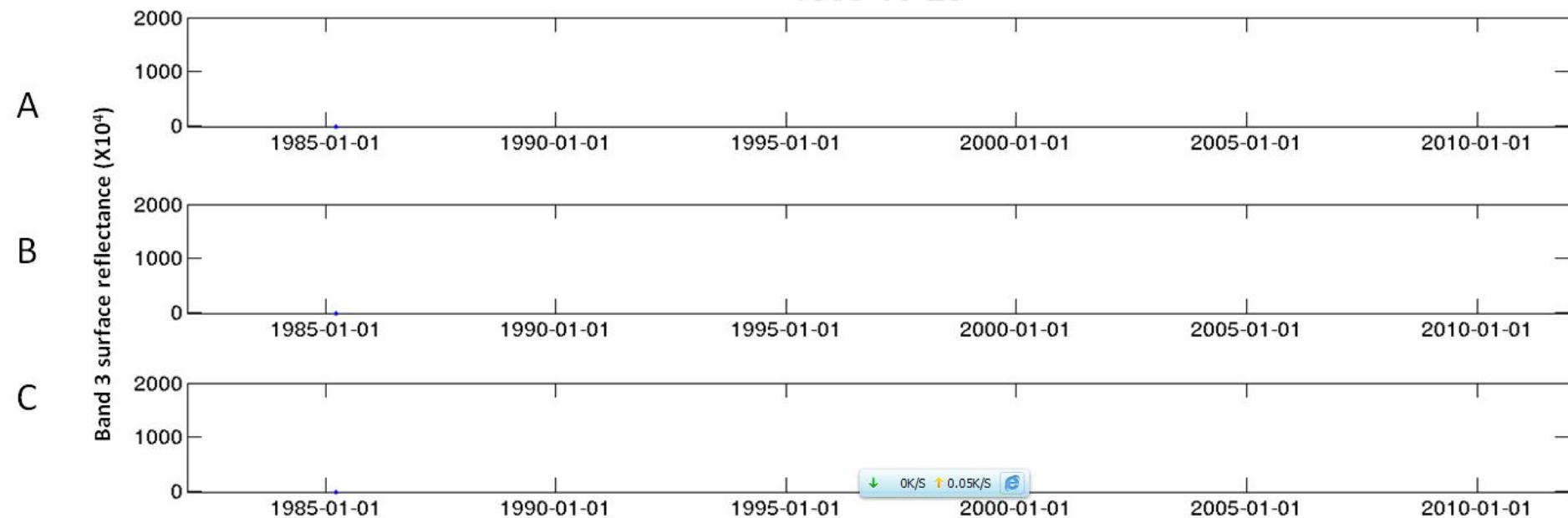
Landsat surface reflectance

Land cover change map

Land cover classification map



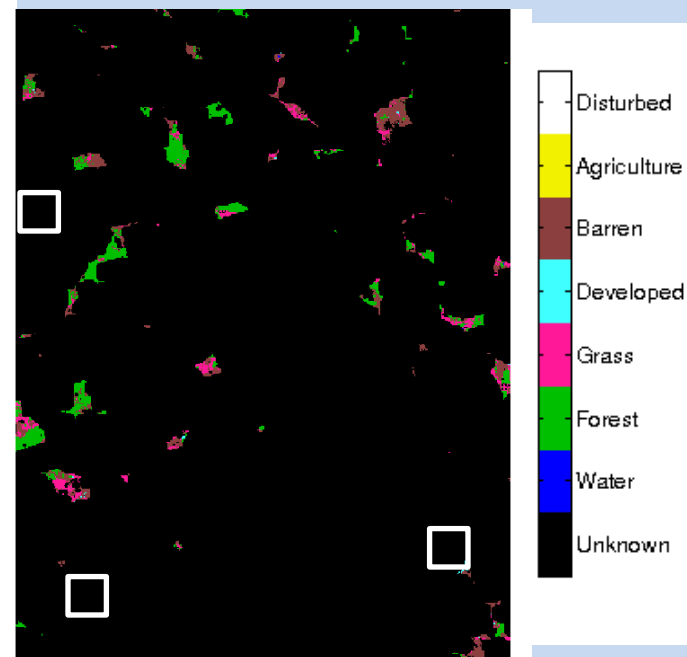
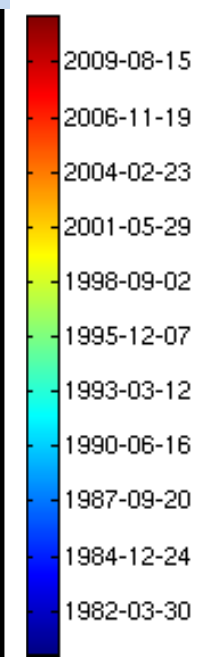
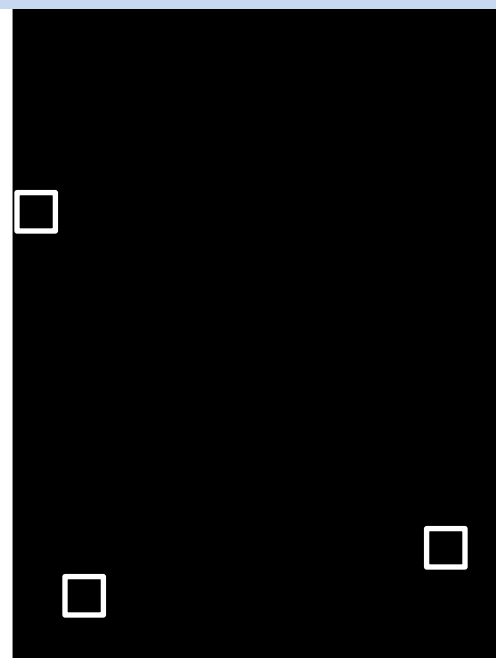
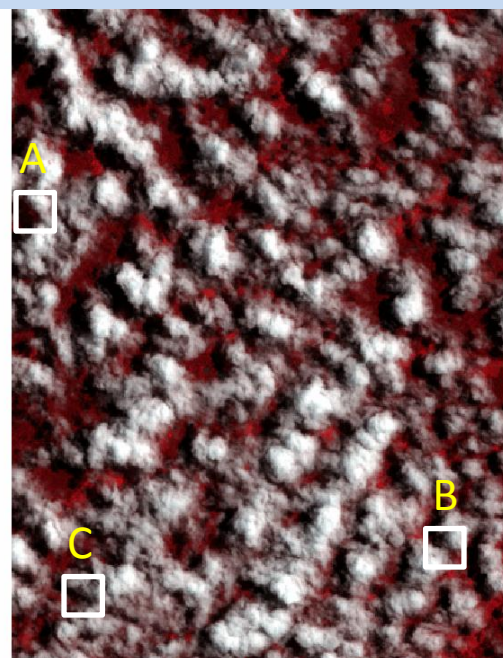
1985-03-28



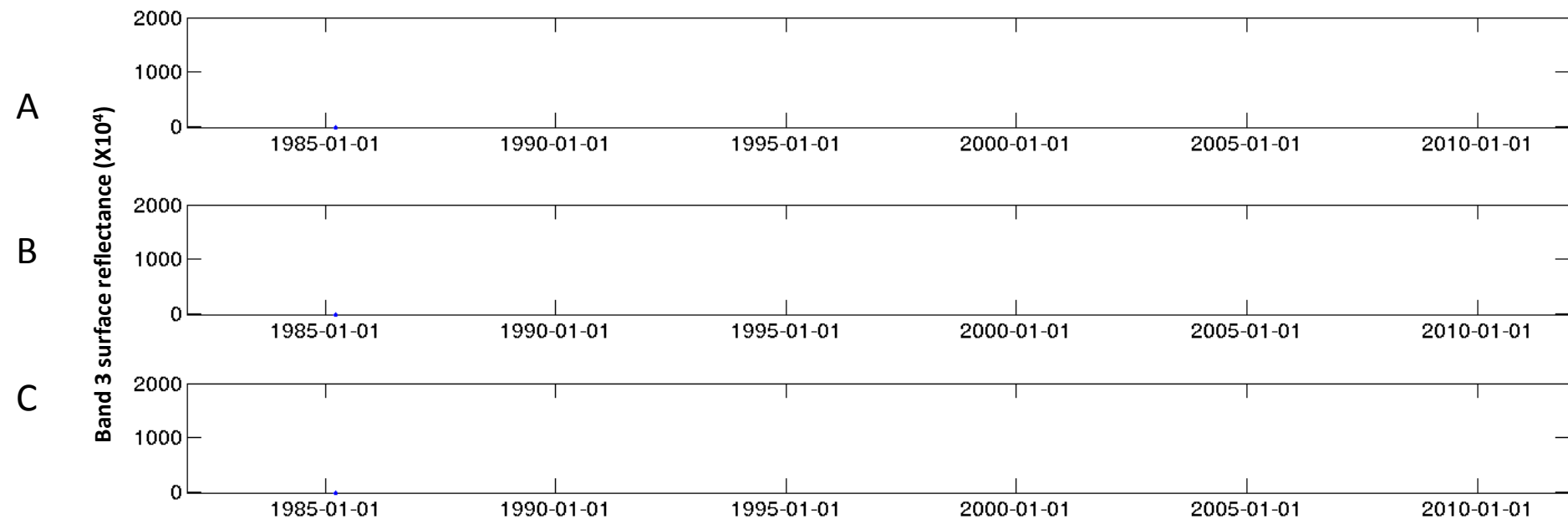
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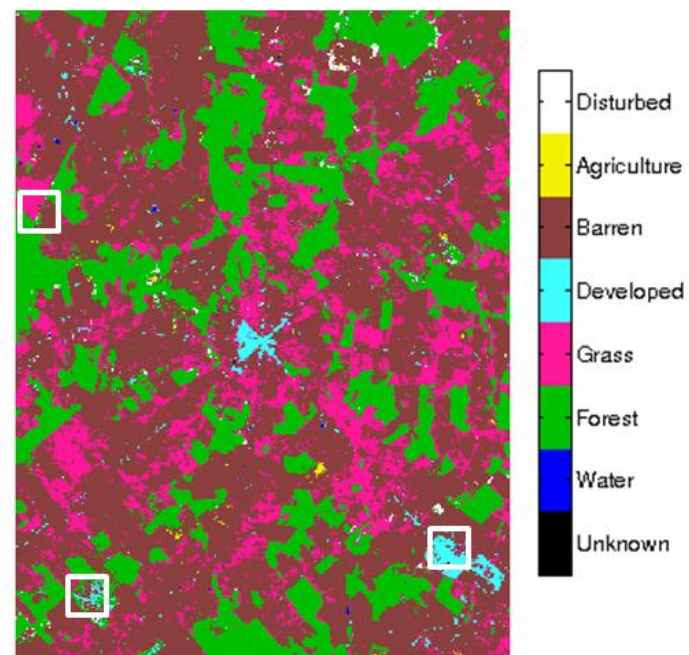
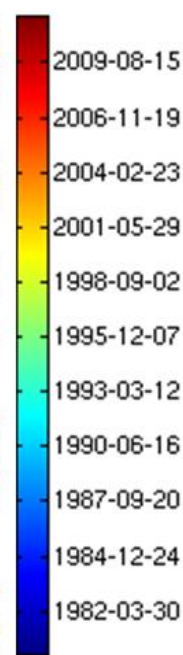
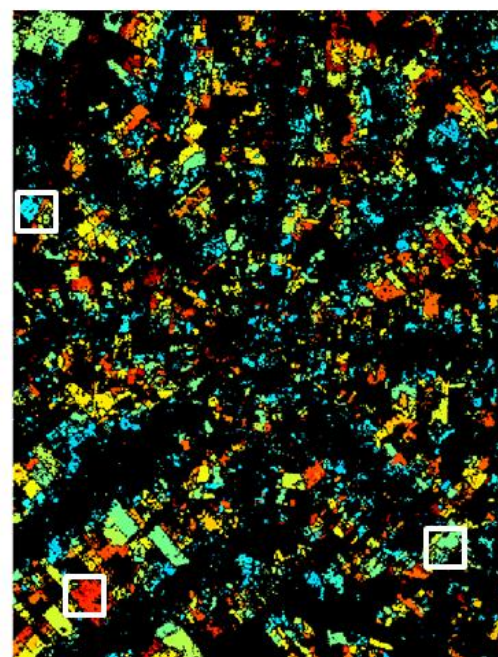
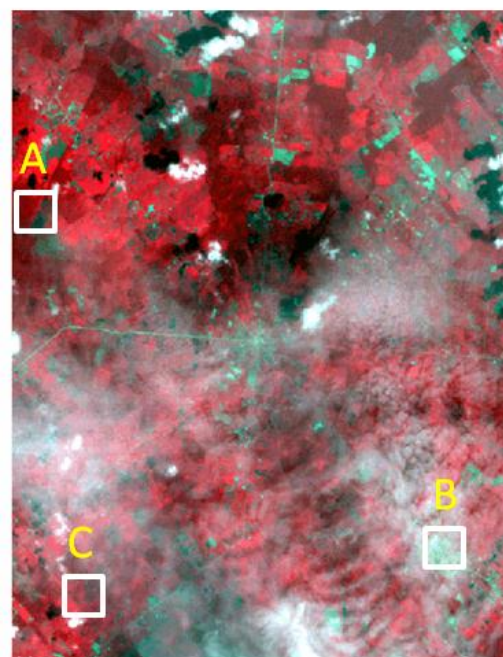
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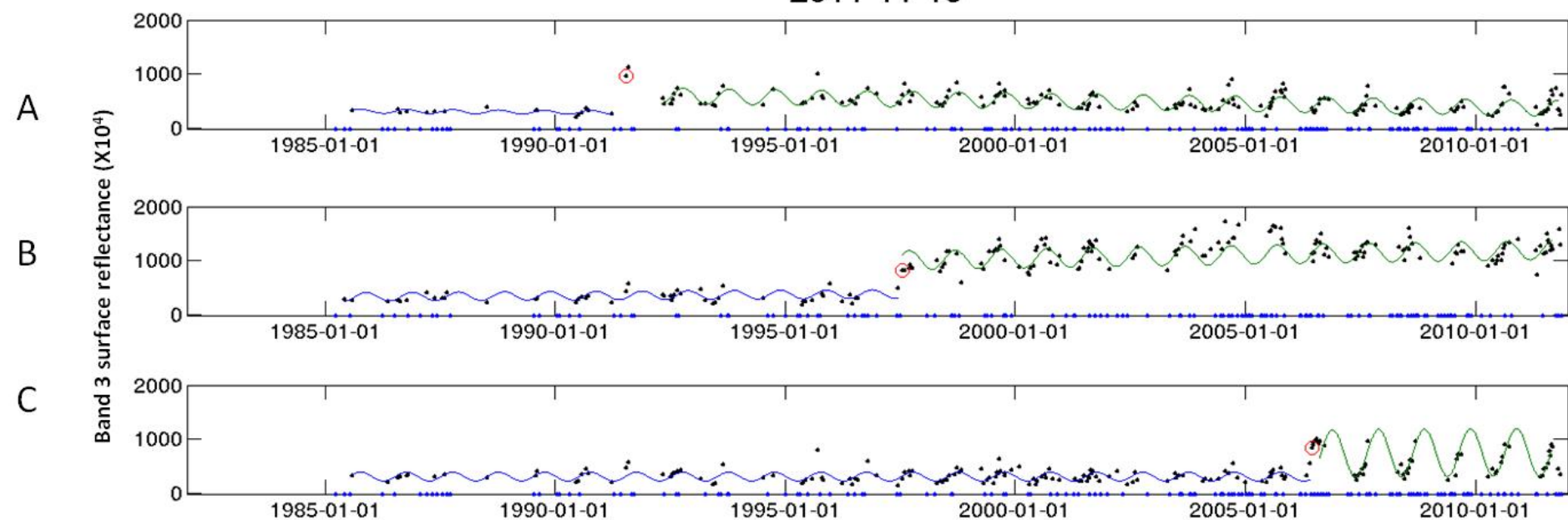
Landsat surface reflectance

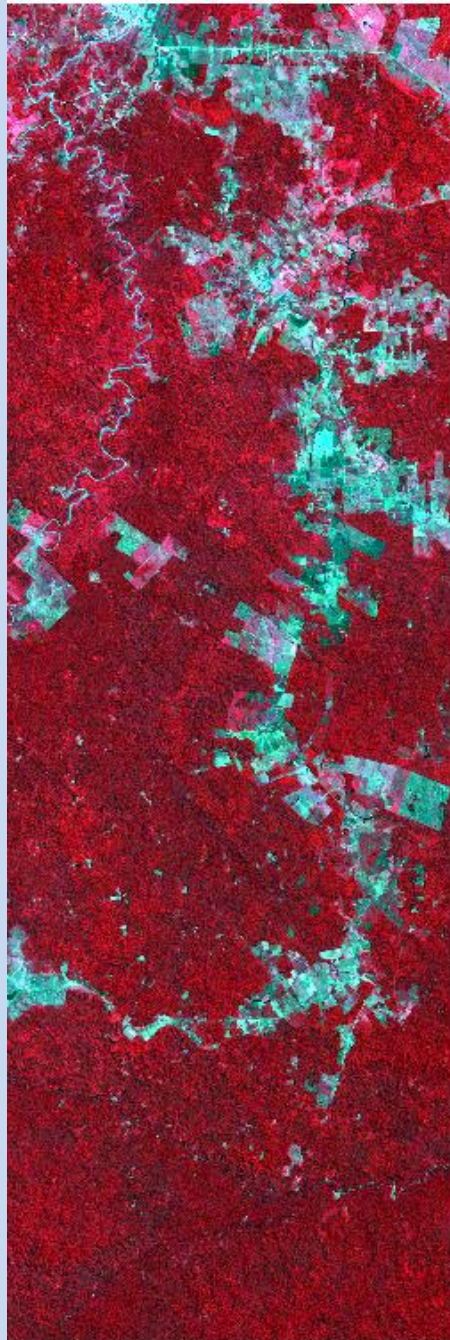
Land cover change map

Land cover classification map

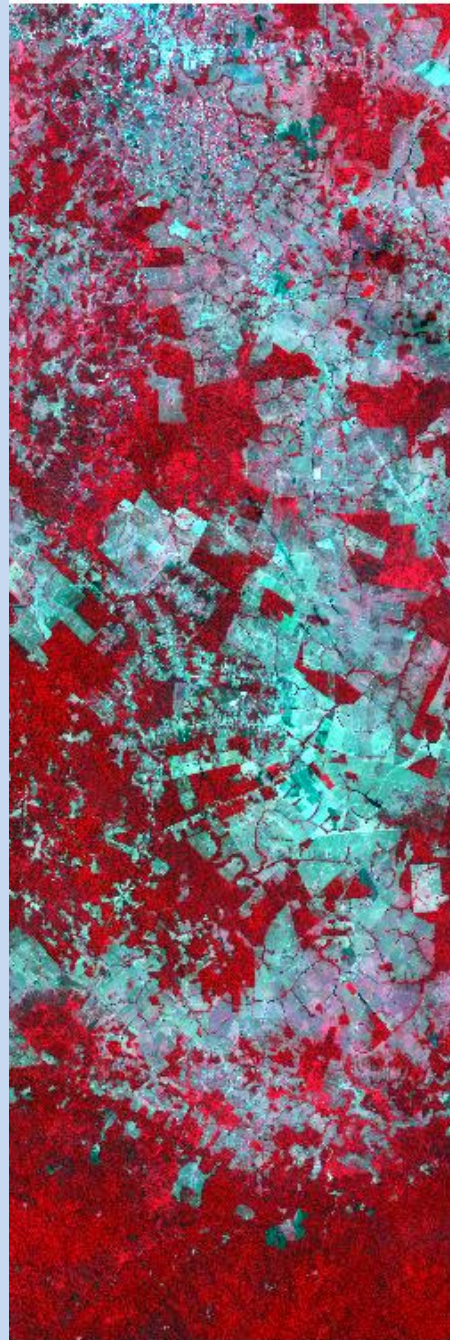


2011-11-15

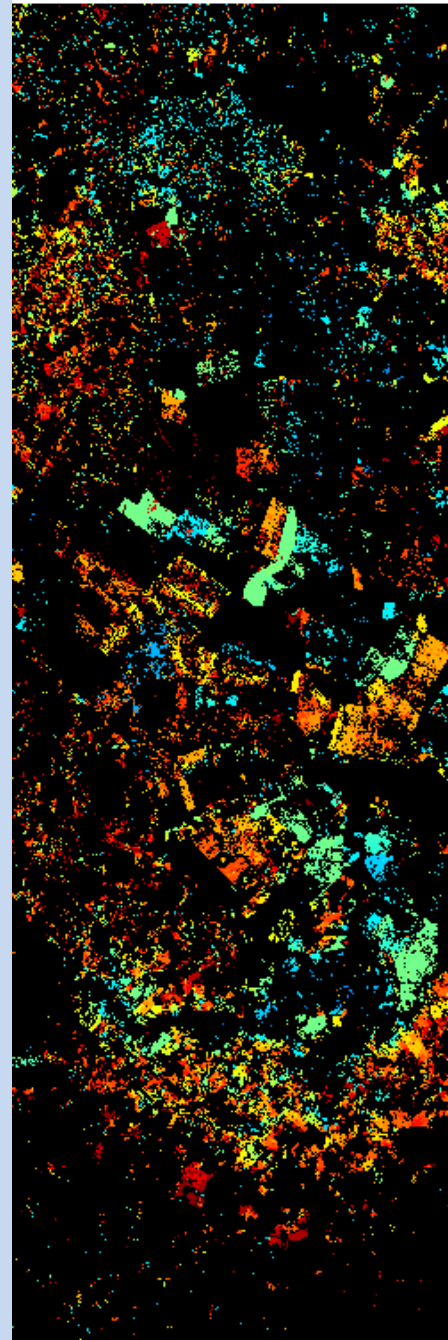




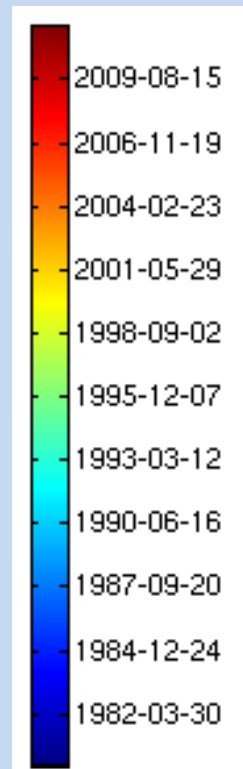
Aug. 6th 1986



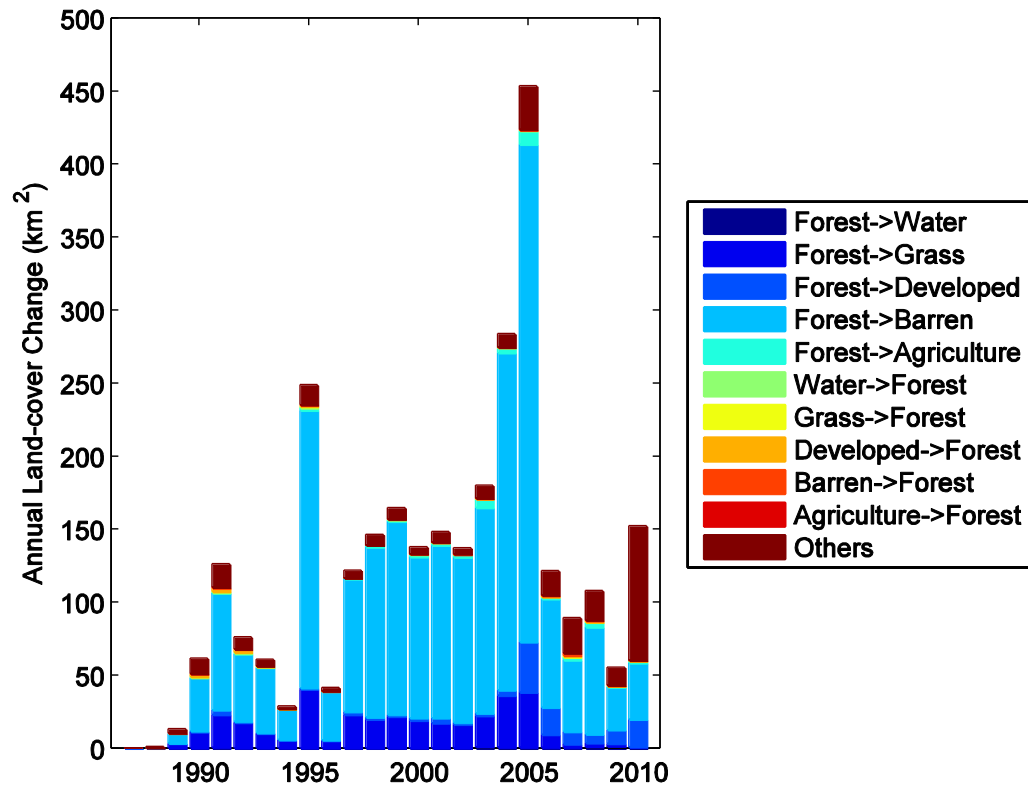
Aug. 27th 2011



Amazon (90kmX30km)

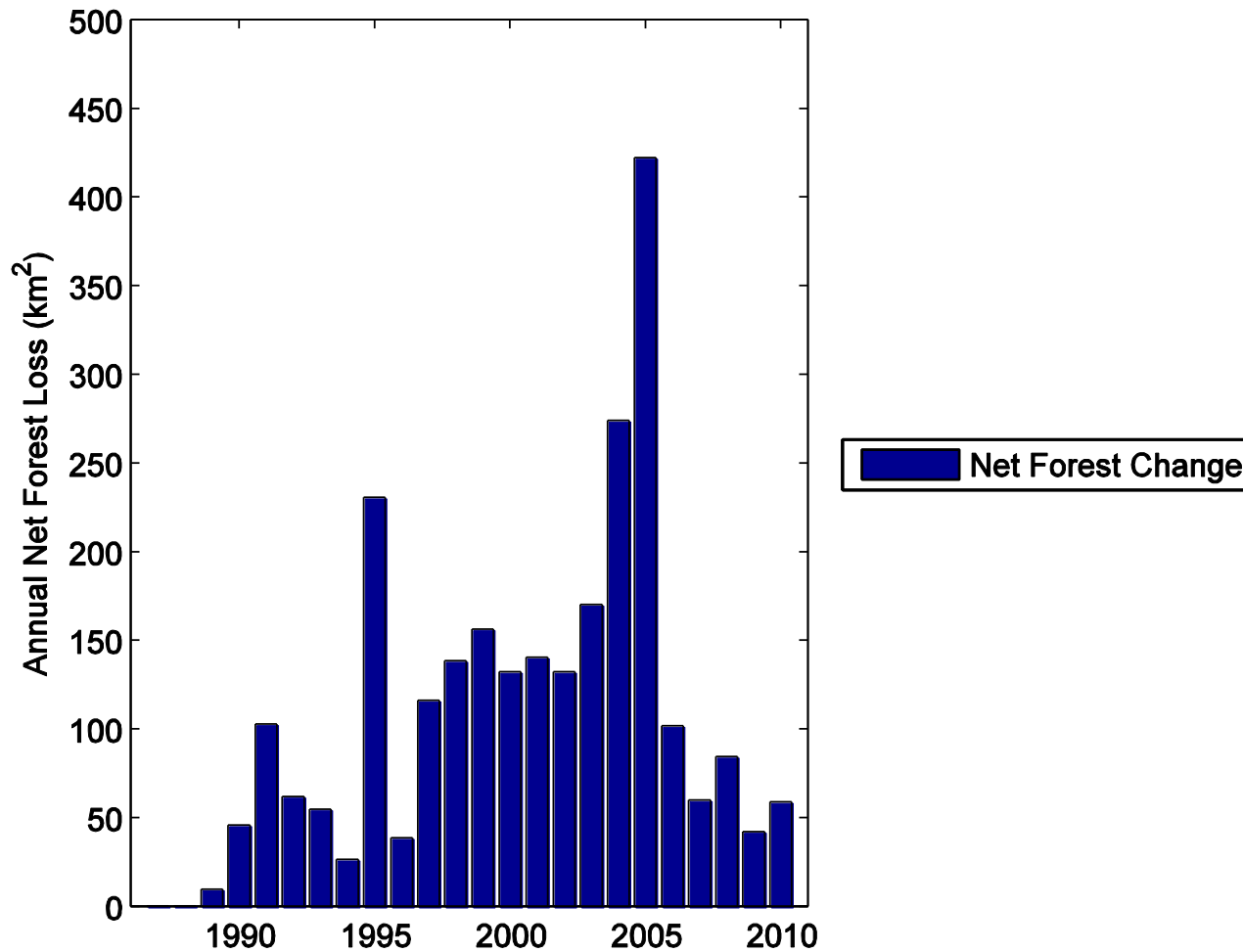


Amazon Scene Annual Land Cover Change Histogram

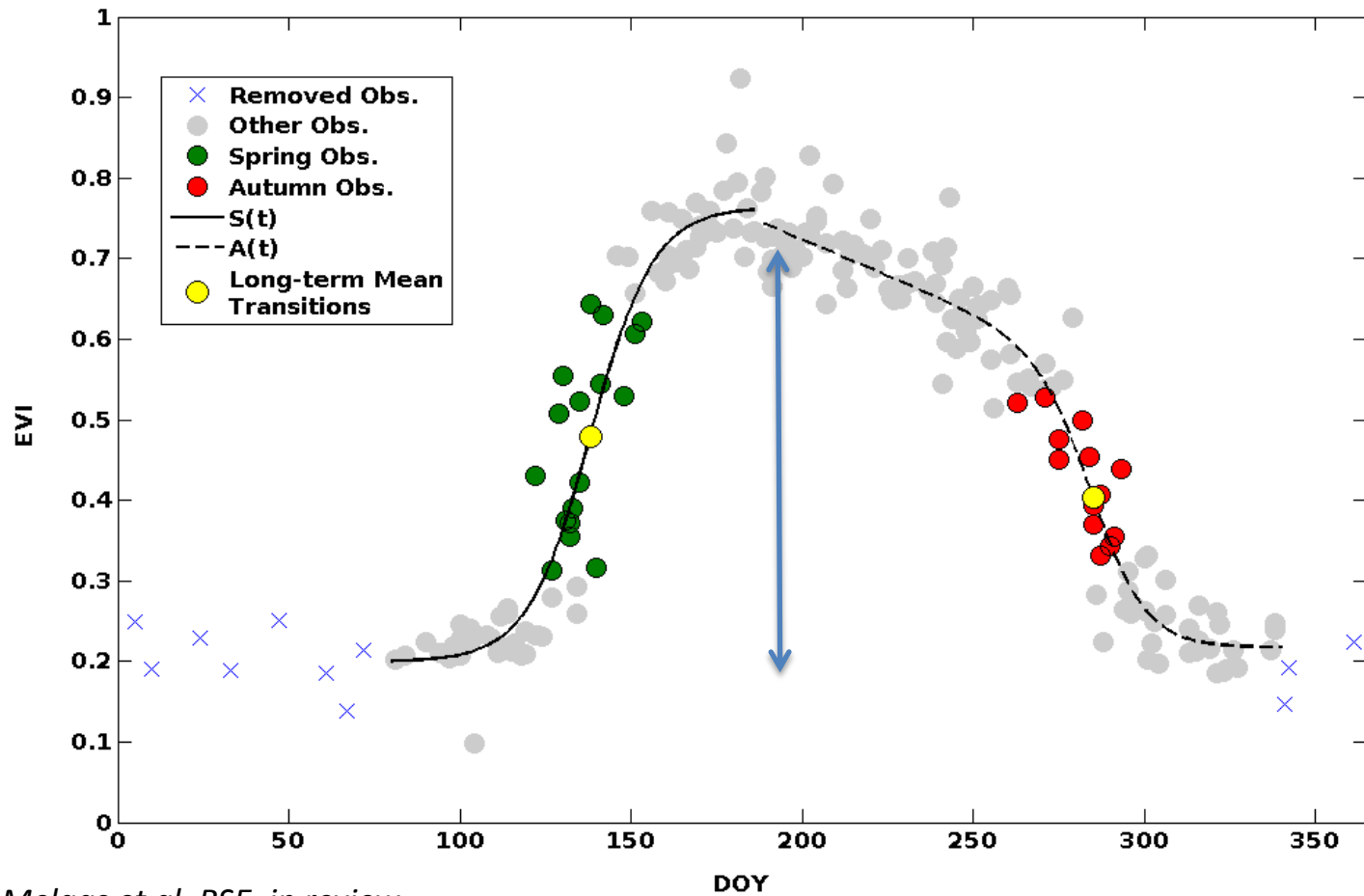


One remaining challenge concerns how to estimate the uncertainties of these Area estimates

Amazon Scene Annual Net Forest Change Histogram



Landsat Phenology

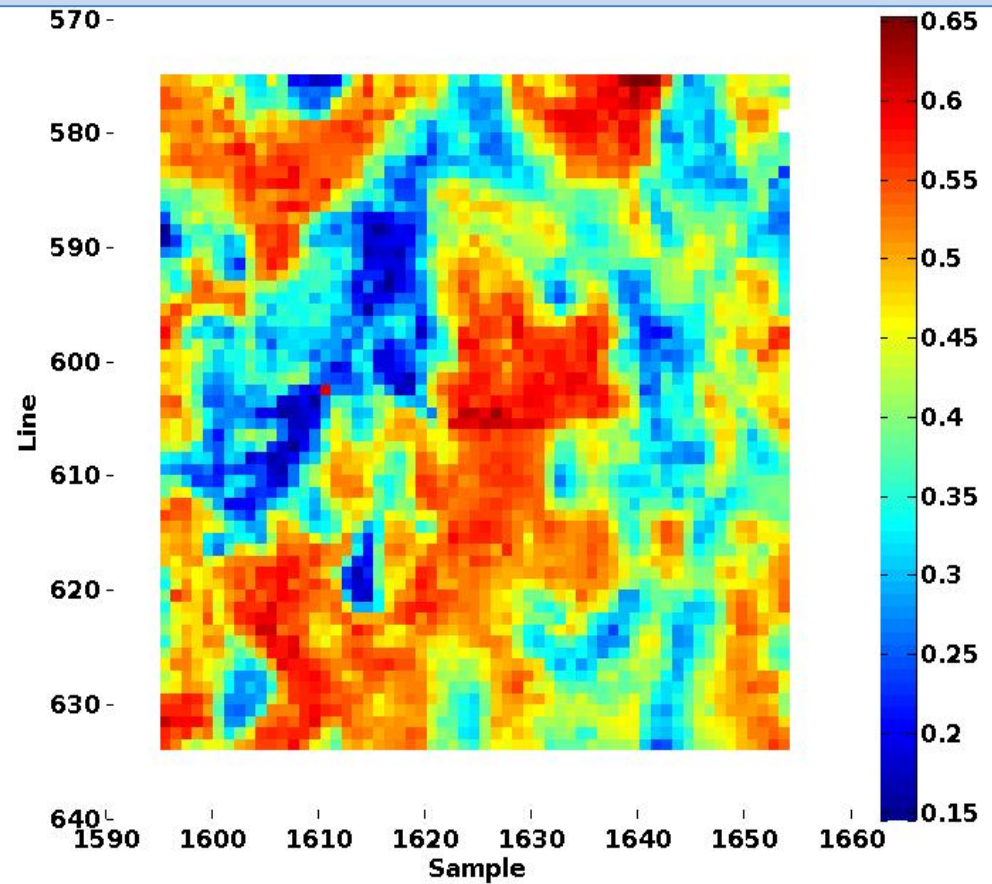


Melaas et al, RSE, in review

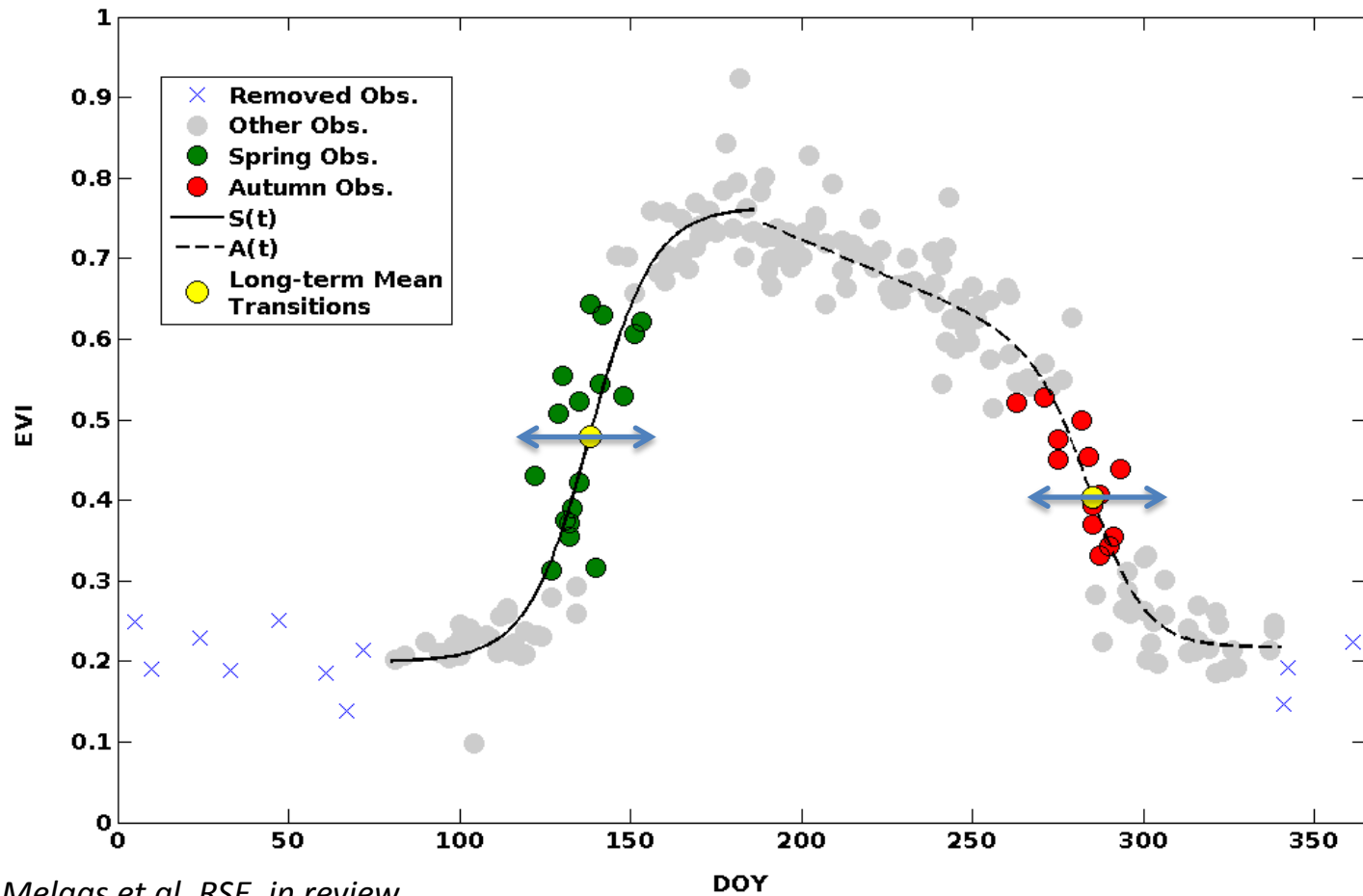
Landsat EVI Amplitude = “Deciduousness”



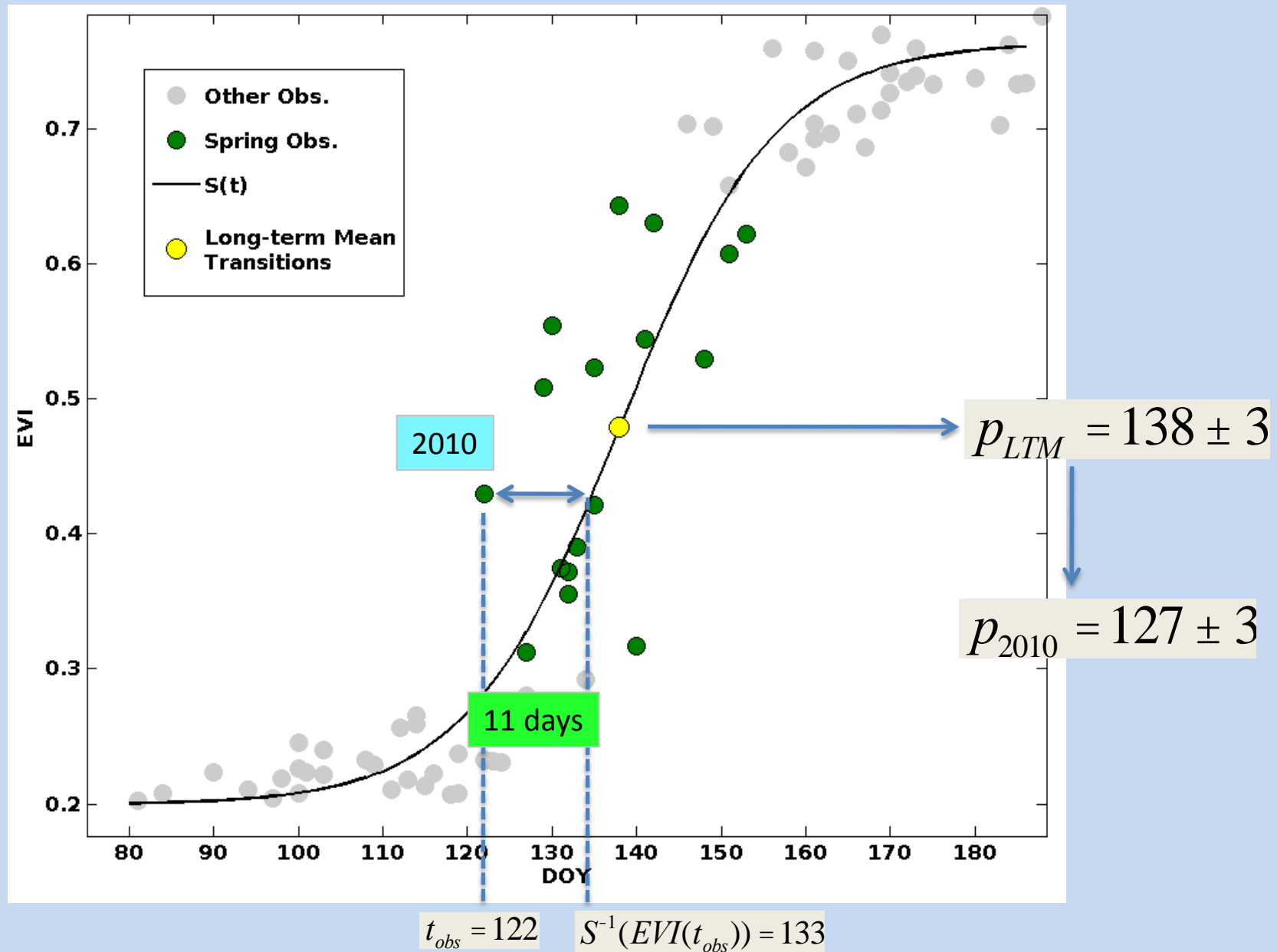
Image credit: Bing Maps



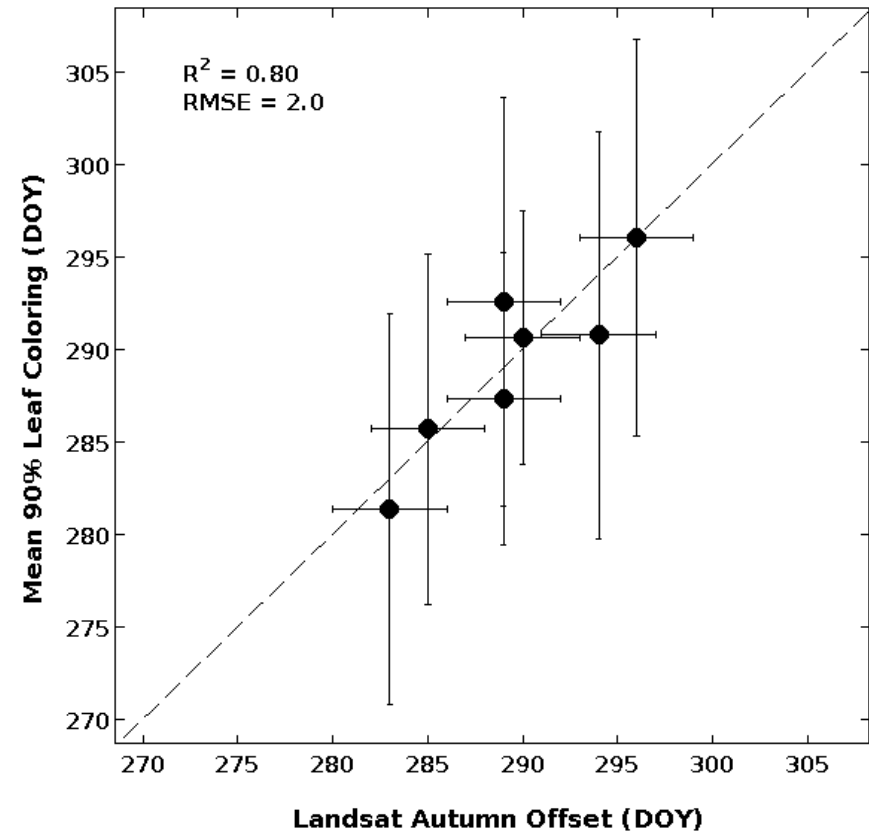
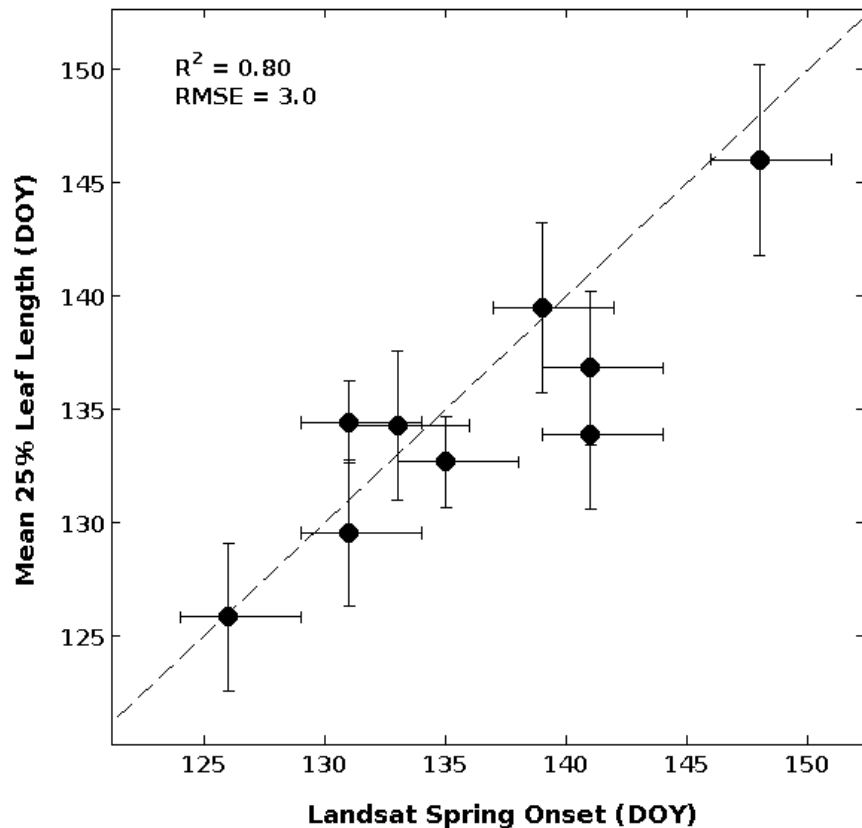
Landsat EVI Deviation from Mean = Interannual Variability



Observation Example



Cross-scale Results – One Pixel

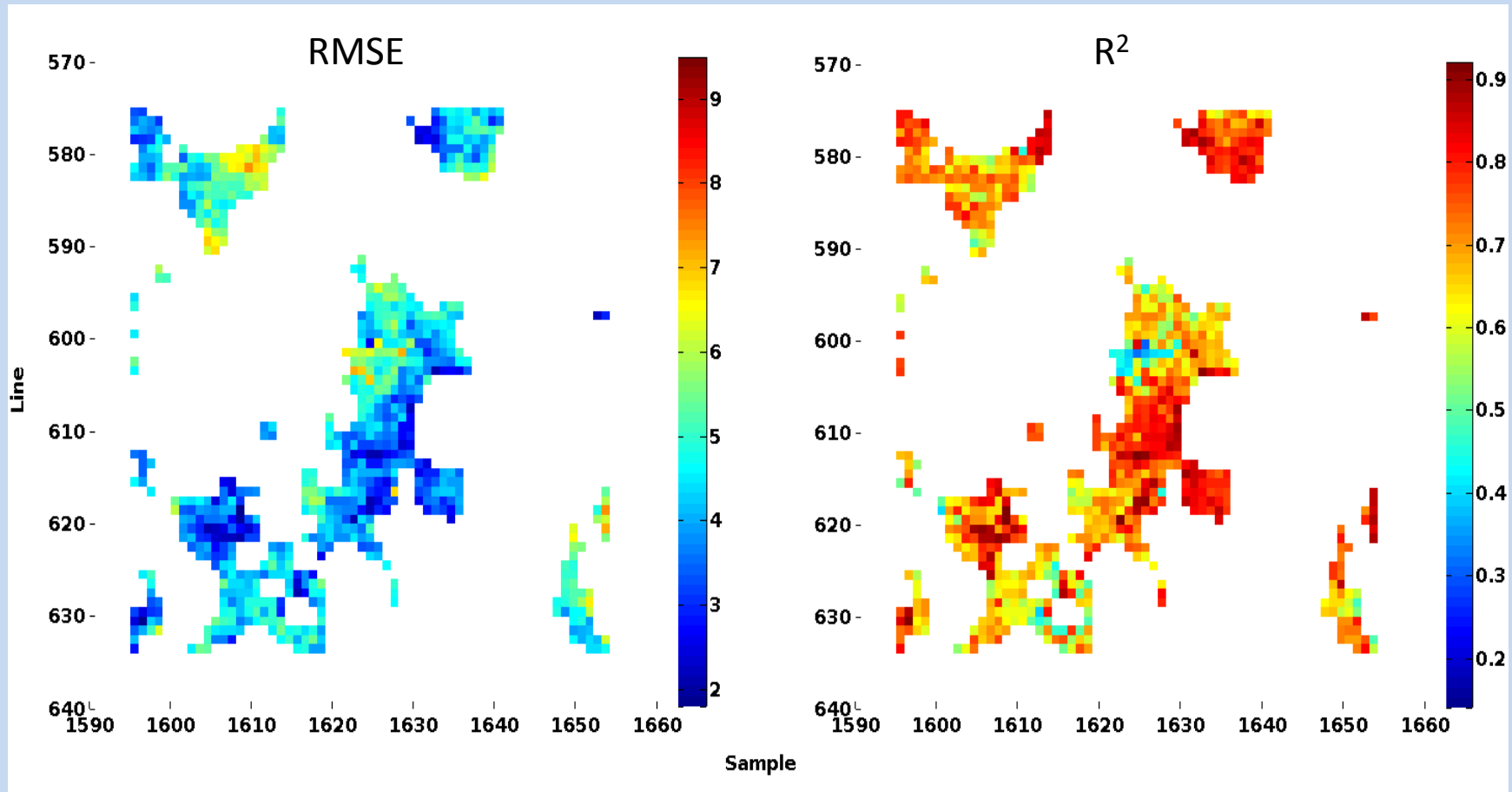


Uncertainty:

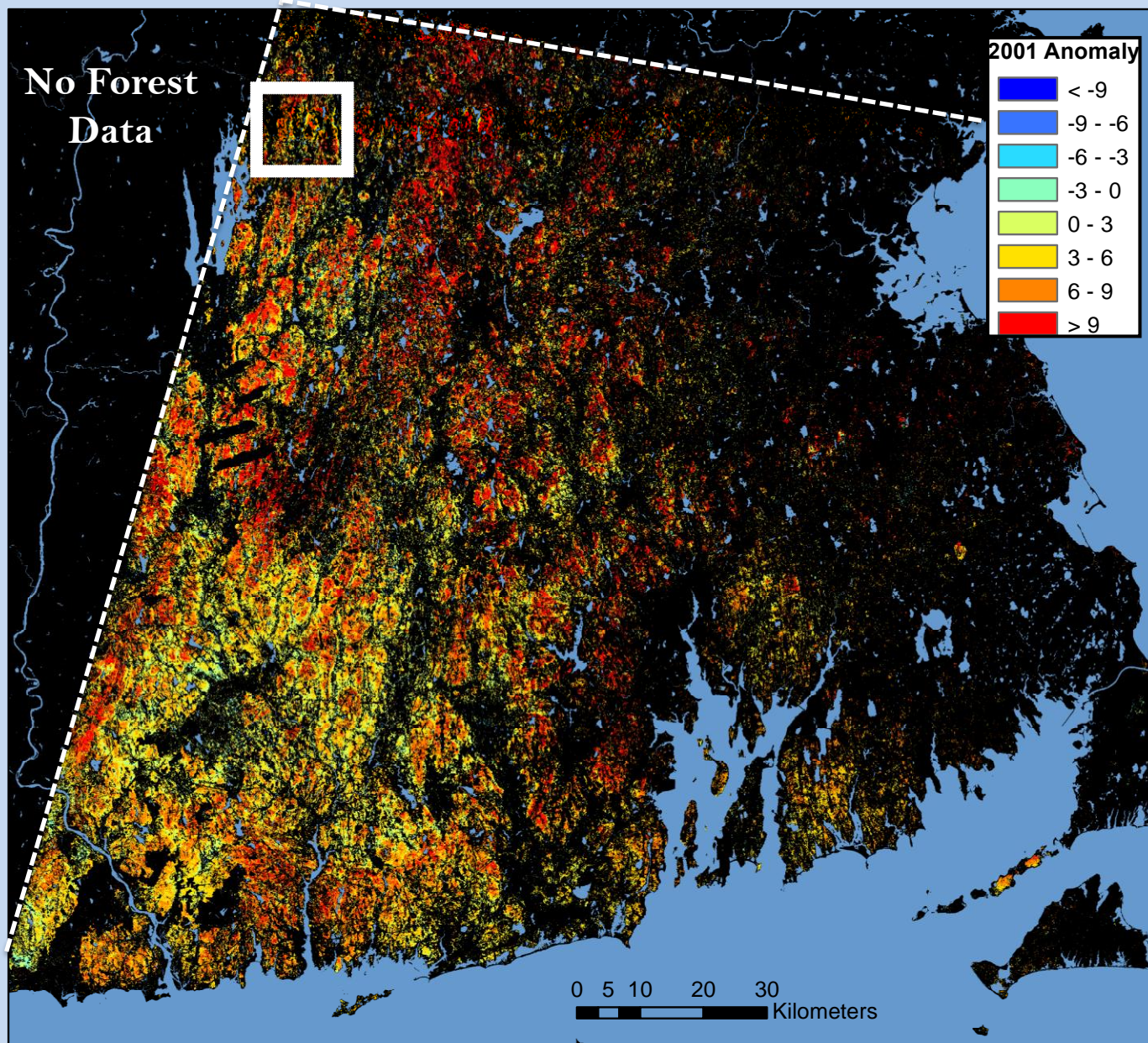
Vertical bars = 1 S.D. across 60 trees

Horizontal bars = 95% confidence intervals for Landsat

Spring Onset from Landsat vs 100% Budburst (Red Oak): 1982-2000

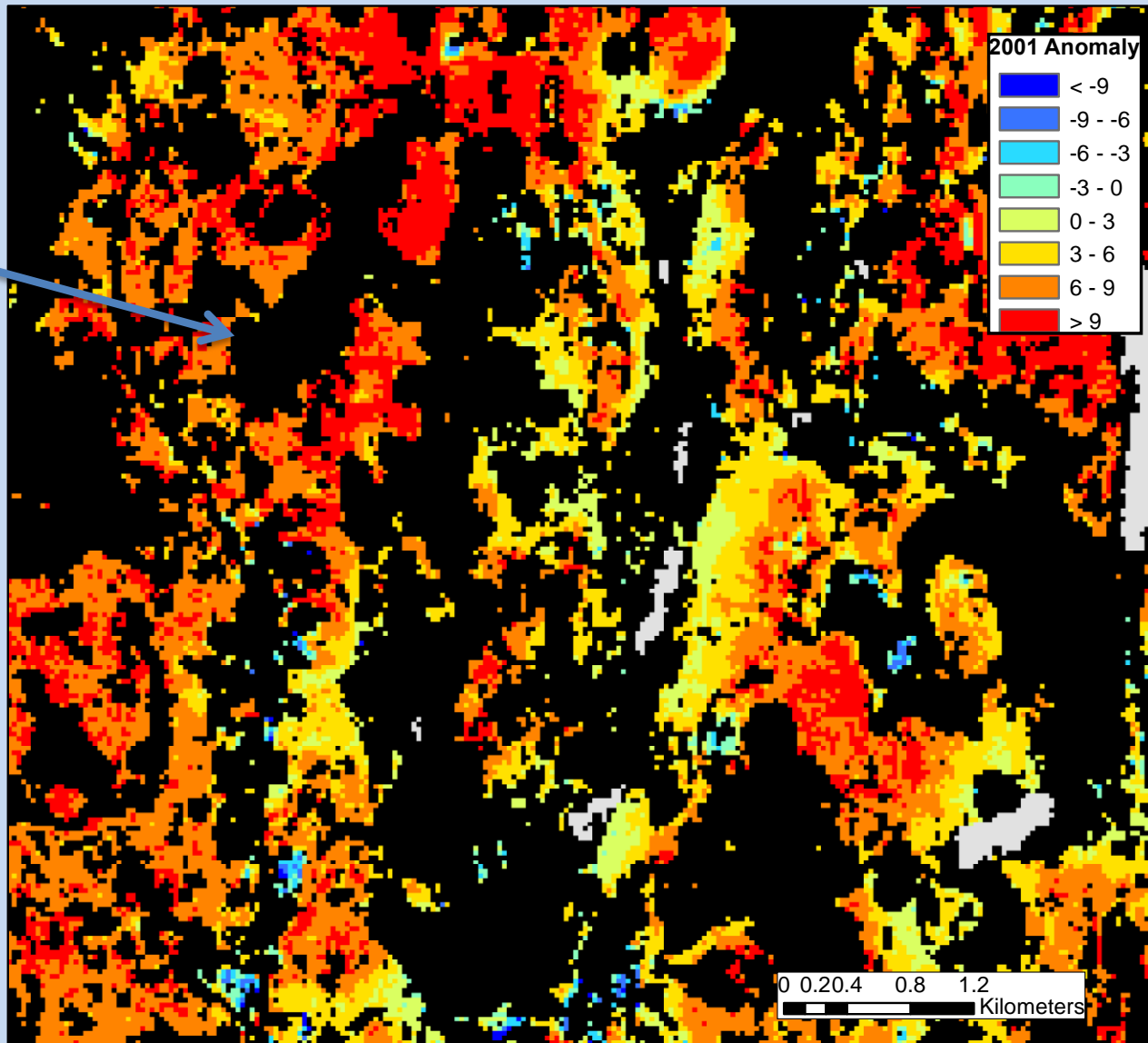


Regional Phenology



Landscape Phenology

Harvard
Forest



Challenges/Opportunities

- Many things to be done and developed
 - Clouds, shadows, snow ... remain challenges
 - Phenology work just getting going
 - Time series analysis still very simple – many new approaches to be tested/integrated
 - integrate data from other sensors
- Number of potential “products”
 - Clouds and shadows as well as snow and water masks
 - Phenology (intra and interannual)
 - Land cover change
 - Land cover condition and trends
 - Episodic events